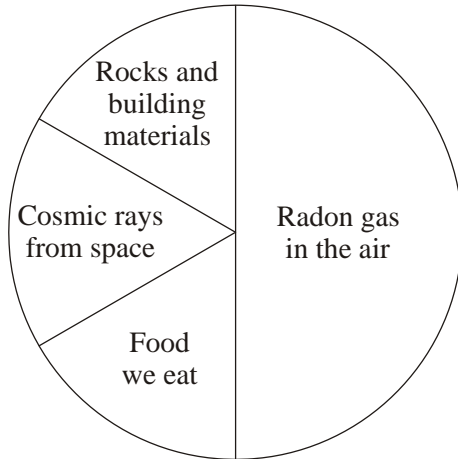


Atoms and radiation

1. (a) The pie chart shows the average proportions of natural background radiation from various sources in one part of the UK.



- (i) What proportion of the background radiation comes from radon gas?

.....

(1)

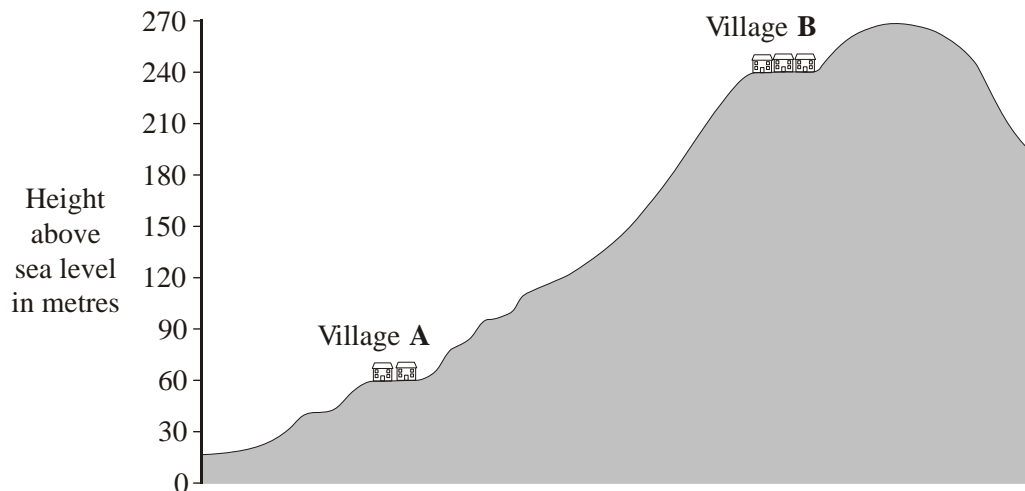
- (ii) Suggest why our bodies are slightly radioactive.

.....

(1)

- (b) The level of background radiation from cosmic rays is not the same everywhere. For every 30 metres above sea level, the amount of background radiation increases by one unit.

The diagram shows the position of two villages, **A** and **B**, built on a hill.



How is the amount of background radiation from cosmic rays different in village **A** compared to village **B**?

To obtain full marks you must include a calculation in your answer.

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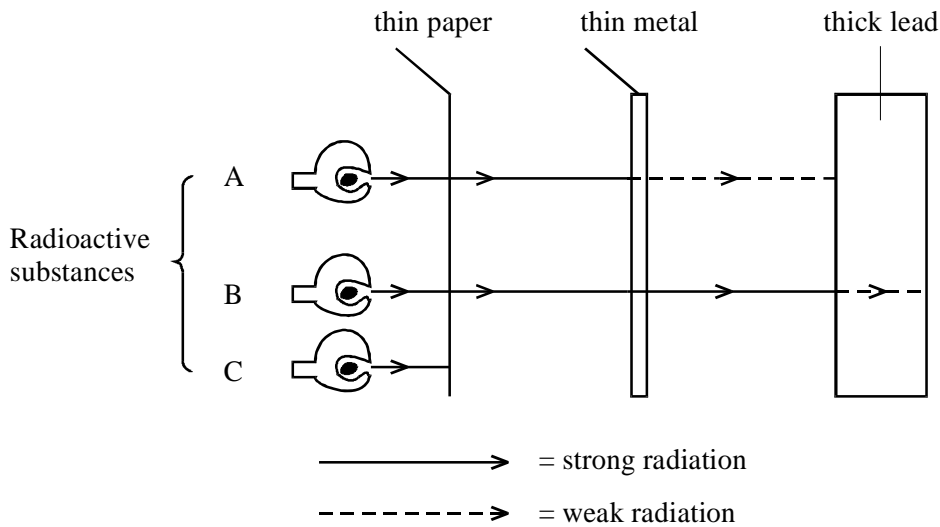
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(3)
(Total 5 marks)

2. The diagram shows what happens to the radiation from three radioactive substances when different materials are put in the way.



Choose types of radiation from this list to complete the table below.

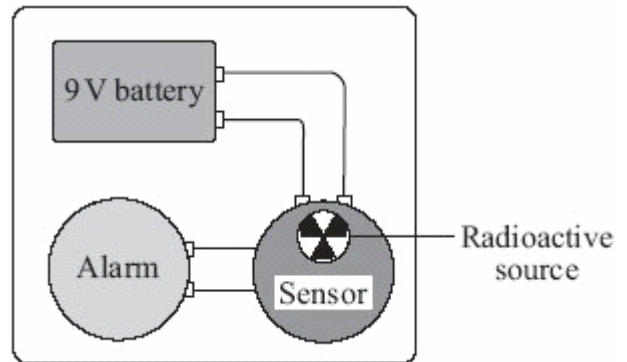
α (alpha) β (beta) γ (gamma) UV (ultraviolet)

RADIOACTIVE SUBSTANCE	TYPE OF RADIATION IT EMITS
A	
B	
C	

(Total 3 marks)

3. (a) The diagram shows the parts of a smoke detector. The radioactive source emits alpha particles.

The alpha particles ionise the air inside the sensor which causes a small electric current. Any smoke getting into the sensor changes the current. The change in current sets the alarm off.



- (i) The smoke detector would **not** work if a radioactive source that emitted only gamma rays was used. Why not?

.....

(1)

- (ii) Curium-242 is a radioactive isotope with a half-life of 160 days. It emits alpha particles. Why is curium-242 **not** suitable for use inside smoke detectors?

.....

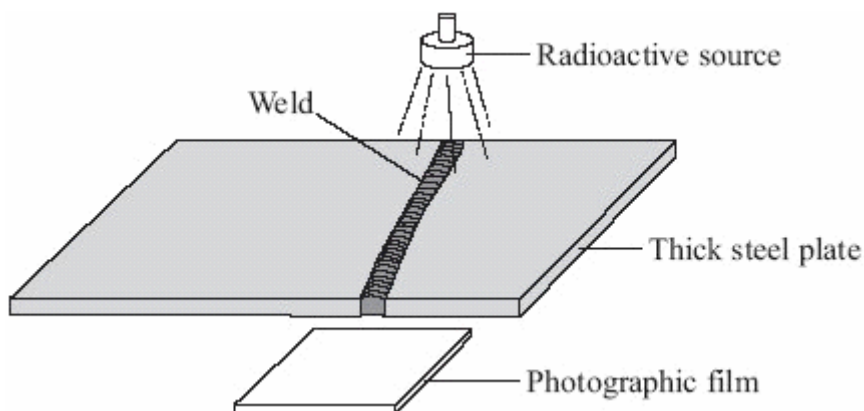
(1)

- (iii) Curium-242 and curium-244 are two of the isotopes of the element curium. How is an atom of curium-242 different from an atom of curium-244?

.....

(1)

- (b) Sections of steel are often joined by welding them together. The diagram shows how a radioactive source can be used to check for tiny cracks in the weld.



Cracks in the weld will be shown up on the photographic film below the thick steel plate.

(i) Which type of source, alpha, beta or gamma, should be used to check the weld?

.....

(1)

(ii) Give a reason why the other two types of source **cannot** be used.

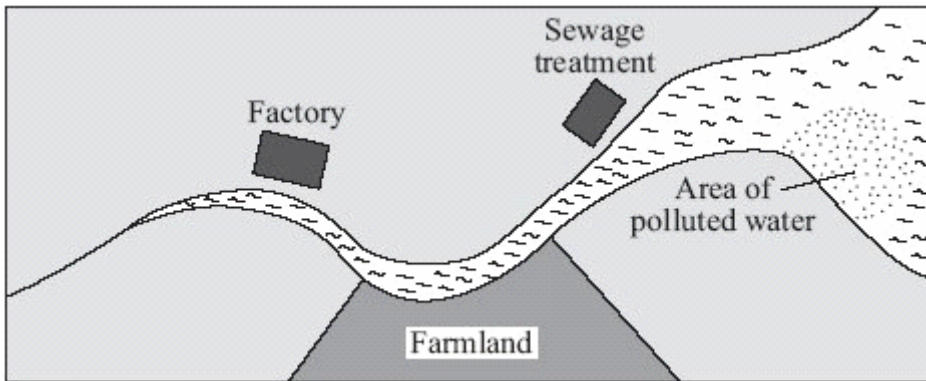
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(1)

(c) The diagram shows a map of a river and its estuary.

Environmental scientists have found that the water flowing into one part of the river estuary is polluted. To find where the pollution is coming from, the scientists use a radioactive isotope, gold-198.



(i) Explain how the gold-198 is used to find where the pollution is coming from.

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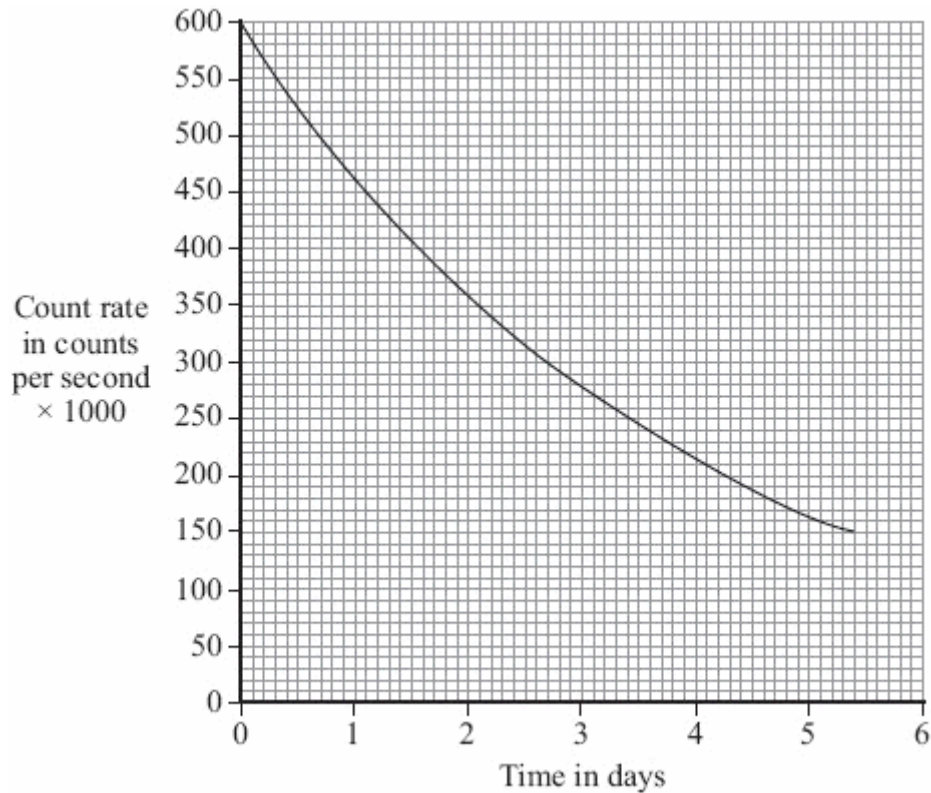
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(2)

(ii) The graph shows how the count rate from a sample of gold-198 changes with time.



Use the graph to calculate the half-life of gold-198.

Show clearly on the graph how you obtain your answer.

.....

Half-life = days

(2)
 (Total 9 marks)